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## BATTERY-RECHARGING DEVICE

The present invention relates to a battery-recharging device.

10 More specifically, the invention relates to a recharging device for rechargeable batteries, which can also be used as an exhibitor for blister-packaged battery packs (blister packaging).

It is known that rechargeable batteries have the  
15 disadvantage of being capable of preserving energy for relatively short periods of time.

The typical self-discharging time of an Ni-Cd or Ni-MH battery is in fact a few months and only rarely and under high storage temperature conditions does it reach  
20 12 months.

Also considering the fact that the times necessary for the provisioning of batteries on the part of sales points, in a modern goods distribution system, are becoming increasingly more limited, the final customer is al-  
25 most always obliged to buy flat batteries and must there-

fore recharge them before use.

With respect to the requirements mentioned above and to overcome the limits specified, an objective of the present invention is to provide a rechargeable battery-  
5 charging device which allows the user to purchase fully charged batteries, to be able to check the charge degree and possibly recharge the above batteries directly at the sales point where the purchase is made, thus allowing charged batteries to be constantly available for the cli-  
10 ents.

This is particularly useful in the case of the purchase of cellular telephones, radios, portable hifi plants, digital cameras and all consumer electronic equipment which can be currently purchased at sales  
15 points and used directly.

A further objective of the present invention is to provide a battery-recharging device which can also be directly used as an exhibitor of blister packaged battery-packs, at the sales point.

20 Another objective of the present invention is to provide a battery-recharging device which allows an easy handling of the charging and charge maintenance operations of batteries directly at the sales point.

Yet another objective of the invention is to provide  
25 a low-cost battery-recharging device, which allows elec-

trical access to the of the packaged batteries, without having to open the blister packaging and thus enabling the sale of a "fresh" product to the client, with all the energy available right from the start.

5           A further objective of the invention is to provide a battery-recharging device which allows the supply of charged batteries, for use in places open to the public, so that the client can select and remove one or more of the blister packages.

10           Another objective of the invention is to indicate a battery-recharging device which is easy and economical to produce, without the use of complex or particularly costly technologies.

          These and other objectives are achieved by providing  
15 a battery-recharging device according to claim 1, to which reference should be made for the sake of brevity.

          In a first embodiment of the invention, the charging device advantageously comprises a support which includes a series of seats or housings for the connection and  
20 linking of the battery packs on sale, a feeding wire for connection to the power supply at 230 Volts, a base with the appropriate recharging circuits and a specific housing for the temporary resting a blister package of batteries whose charge level is to be checked.

25           In alternative embodiments of the recharging device,

it substantially consists of:

- a charger of rechargeable battery blister packages;
- a selector and automatic supplier of blister packages of charged batteries;
- 5     - an automatic payment system.

In this case, the blister packages are contained in a collecting device which comprises recharging circuits and automatic selection and supply means of the blister packages selected by the user, by means of a series of push  
10     buttons situated outside the recharging device.

This also enables the user to be completely autonomous as the device is also equipped with an automatic payment mechanism.

The collecting device can also be filled by the  
15     shopkeeper with blister packages of flat batteries and is capable of automatically charging the packaged batteries and supplying them, only after the charge has been controlled and effected.

Further characteristics and advantages of a battery-  
20     recharging device, according to the invention, will appear more evident from the following description and enclosed drawings, in which:

- figure 1 schematically shows a front view of a first embodiment of a battery-recharging device, of the multiple type, according to the present invention, which can  
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also be used as an exhibitor, in sales points, of blister packaged battery packs;

- figure 2 is a schematic front view of a blister packaged pack of batteries which can be used in the recharging device of the multiple type of figure 1, according to the present invention;

- figures 3 and 3A respectively show a front view and a perspective view of a blister packaging for batteries suitable for being used in a charge restoration and maintenance device, according to the present invention, which can be used for a first type of battery;

- figures 4 and 4A respectively show a front view and a perspective view of a battery packaging, according to the present invention, which can be used for a second type of battery;

- figures 5 and 5A respectively show a front view and a perspective view of a battery packaging, according to the present invention, which can be used for a third type of battery;

- figure 6 shows a schematic and exploded perspective view of a second embodiment of the battery-recharging device, according to the present invention;

- figure 7 shows a combination of the main types of blister packages and relative batteries used, indicating the contact phase displacement to allow the automatic selec-

tion of the type of battery when inserting the packaging in the recharging device of the invention;

- figures 8, 8A and 8B illustrate in detail a first embodiment of the contact system which allows the electric connection between the recharging circuits and the contacts of the battery packages in the recharging device of figure 6, according to the present invention;
- figures 9 and 10 show other possible embodiments of the electric contacting system alternative to those illustrated in figures 8, 8A and 8B, according to the invention;
- figure 11A shows a front view of a third embodiment of a blister packaged battery-recharging device, also suitable for the automatic distribution of the packages, according to the present invention;
- figure 11B is a side view of the recharging device according to figure 11A;
- figure 12 shows an enlarged sectional detail of a charging and expulsion device (supply) of each blister package of batteries, present in the battery-recharging device according to figures 11A and 11B, according to the invention;
- figures 13A shows a front view of a variant of the battery-recharging device according to figures 11A and 11B, according to the present invention;

- figure 13B is a side view of the battery-recharging device according to figure 13A;
- figures 14A and 14B respectively show a front view and a side view of an enlarged detail of the recharging and supply mechanism of the blister packages present in the recharging device according to figures 13A and 13B;
- figure 15 shows an exploded perspective view of a further embodiment of a blister packaging of rechargeable batteries, which can be used inside the battery-recharging device according to figures 13A and 13B;
- figure 16 shows a schematic sectional view of a technical solution which can be adopted in the battery-recharging device according to figures 13A and 13B.

With particular reference to figures 1 and 2, which represent a first preferred and illustrative embodiment, the battery-recharging device, which can also be used as a display element in various sales points, substantially comprises a front support 1, fitted with a rest base 9, which includes a series of seats or housings, indicated generically and as a whole with 2 (figure 1), for the connection and/or linking of battery packs 5 (figure 2), preferably blister packaged, which must be charged, kept charged and sold.

The recharging device also includes a feeding cable 3 for connection to the electric power supply at 230

Volts, whereas the rest base 9 comprises a series of suitable recharging circuits; there can also be an appropriate housing 4, which can be used for the temporary resting of a package or pack of batteries 5, whose charge level is to be checked.

The battery pack or blister packaging 5 is preferably produced for containing and grouping, for example, 4 Ni-MH batteries of the 2000 mAh "size AA" type and is constructed so as to allow it to be linked to one of the housings indicated with reference 2, which envisage connection to the specific charging and charge maintenance circuits contained in the base 9, in order to recharge and maintain the charge of the batteries 6 contained in the blister packaging 5 until it is sold.

Each pack of batteries 5 is, on the other hand, constructed so that all the batteries 6 contained therein (for example 4 pieces for each pack of batteries 5, as illustrated in figure 2) are connected in series and only the two terminals 7, 8, positioned in correspondence with the first and last battery 6, are accessible for connection to the recharging device.

The terminals 7, 8 are situated inside each blister packaging 5 for safety purposes, so that it is therefore impossible for them to be short-circuited by unintentionally resting the pack of batteries 5 on a metallic sur-



face or putting them in a pocket, for example, in contact with a set of keys.

For this reason, the recharging device, which can also be used as an exhibitor in a sales point, is produced so that each recharging housing 2 has a pair of respective terminals, suitable for being inserted in the terminals 7, 8 of the blister packaging 5 for hanging it, recharging it and maintaining its charge level.

Furthermore, when the customer purchases the battery pack 5, after opening the blister packaging, the above batteries 6 can be freely used separately one from each other.

In practice, each housing 2 is connected to a section of a low-voltage charge circuit and, in turn, each charge circuit, by automatically recognizing the insertion of a pack of batteries 5, activates a charging cycle at the moment of insertion of the pack 5 on the front side 1 of the charging device. Each charging section is of the rapid charge type, i.e. capable of charging the pack of batteries 5 in about 1 hour; after this rapid charging period, the section automatically passes to a charge maintenance mode, by supplying a trickle charge current, in the order of 1/20 of the nominal charge current.

Each housing 2 can also have a LED signaling diode

which indicates when the maximum charge level of the relative battery pack 5 has been reached, so that the salesman can know at any moment which pack 5 is ready for sale.

5        In this way, the salesman always has a certain number of battery packs or packages 5 available each hour, which is equal to the number of recharging housings 2 present in the charger-exhibitor device.

      If, for example, the charger-exhibitor device can  
10    house a number equal to fifty packs or blister packagings  
      5 of batteries 6 for recharging, an average of fifty charged battery packs 5 per hour for sale, will be available, as, as soon as a pack of batteries 5 has been sold, the salesman can immediately substitute it with a pack of  
15    flat batteries (which, in any case, will be ready in about 1 hour's time).

      Alternatively, it is possible to produce a more economical model of the recharging device illustrated in figure 1, conceived for smaller sales points, wherein  
20    each charging section is not of the rapid charging type but has a maximum charge which can generally be reached in 12 hours.

      In this case, the recharging device can be filled with battery packs 5 by the salesman the evening before  
25    the sale and the daily availability for sale will, at the

least, be equal to the number of housings 2 envisaged on the front side 1 of the device.

As already specified, the recharging device and exhibitor can finally also comprise a special housing 4 for checking the charge level of each pack of batteries 5.

In correspondence with this tester, three LED diodes (red, yellow and/or green-coloured) can also be present, which respectively indicate a low charge level, a medium charge level or a high charge level; in this way, the salesman can, at any moment, check the unknown state of a battery pack 5 and the purchaser himself can check the charge level of each package 5 of batteries 6 on sale.

With particular reference to figures 3-10, the blister packaging 5 of batteries 6 is illustrated in some of the possible embodiments, referring to the type of batteries most commonly used.

In particular, figures 3 and 3A show a blister packaging 5 comprising four 1.5 Volt batteries 6, of the AA type, figures 4 and 4A show a blister packaging 5 comprising four 1.5 Volt batteries 6, of the AAA type, whereas figures 5 and 5A show a blister packaging 5 comprising a 6-9 Volt battery.

In any case, each battery packaging or pack 5 includes a printed card 40, on which the batteries 6 are positioned, showing the indications of the manufacturer,

the registration number of the batteries 6 themselves and the instructions for use.

The terminals of the batteries 6 are in contact with each other by means of metallic springs which form electric connections; the whole unit is wrapped in a transparent sheath or lining 60, normally made of a plastic thermo-shrinkable material, which blocks all the elements and makes the whole unit solid.

In the particular case of batteries of the AA type (figures 3 and 3A), the above batteries 6 are connected to each other in series by the springs 70, each of which connects a positive terminal of a battery 6 with the negative terminal of the adjacent battery 6.

The additional springs 80 contact the end terminals (positive pole and negative pole) of the series and makes them accessible on one of the wings of the card 40 of the blister packaging 5.

On this wing, in correspondence with the portion of springs 80 coplanar with the wing itself, there are two holes, indicated with 90, on the plastic thermo-shrinkable material.

In this way, by means of an appropriate electric contacting system, through the holes 90, it is possible to have access to the batteries 6 for its charging, re-charging and maintenance operations.

The cases illustrated in figures 4-4A and 5-5A, respectively, are completely analogous and differ only in the particular type of battery 6 to be charged.

In particular, figures 4 and 4A illustrate batteries 5 6 of the AAA type, whereas figures 5 and 5A show a battery 6 consisting of a single 9 Volt element.

Figure 6 shows an illustrative and preferred further embodiment of the recharging device for batteries, according to the invention, of the rapid connection and error-proof type.  
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More specifically, it is a flat charger 17, which can also have the accessory function of exhibitor of the blister packagings 5 (for example, inside a sales point), having a series of slits 18, in which it is sufficient to  
15 insert the lower wing of each card 40 of the respective blister packaging 5.

The charger 17, in its single or multiple version, i.e. comprising a series of surfaces connected, by means of the bracket 19, to a vertical supporting structure,  
20 can also be advantageously used as exhibitor of the blister packagings 5 in sales points, in order to allow there to be an ever-available supply of charged batteries 6 for the client.

In each slit 18 of the charger 17, it is thus possible  
25 ble to indifferently insert one of the three types of

blister packagings 5, for 1.5 Volt of the AA or AAA type, or 9 Volt, as clearly shown in figure 6, which illustrates the various packagings 5 in the insertion phase.

The slits 18 can have the same length of the lower wing of each blister packaging 5 and all the blister packagings 5 can have, in particular, the same length.

As illustrated more clearly in figure 7, the three types of blister packagings 5 are produced so that the outlet contacts, consisting of the springs 80, are suitably displaced in phase with each other in length (compare the distances indicated with D1, D2 and D3 in figure 7), in correspondence with the lower wing of the card 40.

In this way, the insertion of each blister packaging 5 in the slit 18, in a forced position and determined by the length of the slit 18 itself, causes connection to the correct internal terminals of the charging device 17, thus allowing the necessary charge levels to be automatically selected for the particular type of battery 6 to be charged.

It is therefore possible to use a single charging device or charger 17 for recharging and maintenance in the main types of batteries 6 currently in use.

Figures 8, 8A and 8B show in detail a first embodiment of the electric connection system of the blister packagings 5 inside the slits 18 of the charger 17.

In particular, figure 8 shows a transversal section of the charging device 17 of figure 6, with each packaging 5 inserted in the respective slit 18, whereas figure 8A is an enlargement of the detail C of figure 8 and figure 8B is a specular view with respect to figure 8A.

In this first embodiment, the electric contacting system envisages the use of metallic spheres pushed by springs, allowing a reliable electric connection between the outlets of the charging circuits and contacts of the packagings 5.

The metallic sphere 27, pushed by the spring 28, ensures contact with the spring 80 incorporated in the blister packaging 5, which guarantees contact with the positive or negative terminal 21 of the end battery of the series of 1.5 Volt batteries or 9 Volt single battery (depending on the type of batteries 6 being charged).

A further spring 29, used for constructive simplicity, forms the electric contact with the printed circuit 30 on which the electronic components 20 of the charger 17 are assembled.

This electric connection system combines the advantage of an excellent mechanical retention of the blister packaging 5, once inserted in the slit 18, thanks to a small step situated between the thermoplastic lining 60 of the packaging 5 and the metallic contact 80 (compare

figure 8B for greater clarity), with that of obtaining a good self-cleaning electric contact, thanks to the scraping of the sphere 27 on the contact 80.

Figure 9 illustrates a second possible embodiment of the electric connection system between the blister packaging 5 and the charging device 17.

In this case, the blister packaging 5, which can be more conveniently used for 1.5 Volt batteries of the AA or AAA type, but also for 9 Volt batteries, may not have the spring contacts 80 and the holes 90 are situated in the transparent plastic lining 60, in correspondence with the electric terminals of the batteries 6.

As illustrated in figure 9, which refers to an electric contacting system for 1.5 Volt batteries of the AA or AAA type, the electric contact is obtained by means of a spring nail 38, which pushes on the electric terminal 21 of the battery 6, passing through the hole 90 situated on the transparent lining 60.

The blister packaging 5 is also withheld by a notch 42, which is engaged with an incision on the card 40, at the rear of the packaging 5, whereas the jacket 39 of the spring nail 38 is connected, by means of the electric wire 40A, to the printed circuit 30 which houses the electronic components 20 of the charging device 17.

Figure 10 illustrates a third possible electric con-



nection system between the blister packaging 5 and the charger-exhibitor device 17.

The blister packaging 5 (in the case illustrated as an example in figure 10, this is a blister packaging 5 containing four 1.5 Volt batteries 6 of the AA type, which have a lower spring contact 80) incorporates, according to this embodiment, a small inductor 44, for example with a ferrite nucleus, and a rectifier diode 45.

The blister packaging 5 is also equipped with suitable guiding wings 46 for the inserting of the charging device 17, in which there are suitable slits 18, in this case equipped with guides.

Furthermore, a C-shaped magnetic circuit 47 with polar expansions, on which the coiling 48 is wound, is housed in the charging device 17.

When the blister packaging 5 is inserted in the slits or housings 18, the inductor 44 is inserted between the polar expansions of the magnetic circuit 47 and forms the inductive magnetic coupling between the inductor 44 and the coiling 48.

In this way, the electric energy supplied by the alternating current generator 49 is transferred to the circuit of the blister packaging 5, by means of the inductor 44, and the above electric energy, suitably rectified by the diode 45, charges the batteries 6.

Figure 10 shows an illustration of a blister packaging 5, containing four batteries 6 of the AA type, but it can also completely analogously show the blister packagings 5 for the other battery models.

5           In these cases, the appropriate charge current is dimensioned by varying the number of coils of the inductor 44, different for each different type of battery 6.

          In this way, the charging device 17, with its electrical elements 47, 48, 49, remains the same, universal,  
10       and can also be used with the other electric contacting systems described and for all the blister packaging models 5, and does not require any expedient for determining which type of battery 6 is being used at a certain moment, as the blister packaging 5 itself is dimensioned to  
15       remove the necessary energy from the charger-exhibitor device 17.

          Figures 11A, 11B and 12 refer to a further possible solution of the battery recharging device, object of the present invention. The blister packagings 5 are inserted  
20       in a collector panel 51, which includes the charging device 17 of the batteries 6 and a series of mechanisms for the automatic expulsion of the blister packagings 5 to be supplied, after being appropriately selected by the users.

25           The whole unit is enclosed in an outer safety casing

100, which contains the collector panel 51, a payment device 15 and an electronic panel 50, which controls the selection and supply of each blister packaging 5, once the batteries 6 have been charged.

5       The payment device 15 includes a slit 10 for the introduction of the coins, a display device 12 for counting the coins inserted and three push-buttons 11 for the selection of the desired blister packaging 5, with respect to the type of battery 6; in this respect, batteries of  
10   the AA, AAA or 9 Volt type are preferably available.

      The collector panel 51 is in fact organized so as to be able to contain three blister packaging 5 columns, indicated with 20, 13 and 14 respectively in figure 11A, each of which can indifferently contain rechargeable bat-  
15   teries 6 of the AA, AAA and/or 9 Volt type.

      The blister packagings 5 are introduced into the appropriate recharging slits 18 of the collector panel 51 and kept in a horizontal position by means of shelves 15.

      Each slit 54 can contain a blister packaging 5 containing any of the types of rechargeable batteries (AA, AAA, 9 Volt), as the charging device 17 of the batteries  
20   6 automatically recognizes the type of packaging 5 inserted. In this way, the salesman is further advantaged as he does not have to pay any particular attention during  
25   the filling operation of the charging device.

In order to remove a blister packaging 5 containing the desired type of battery 6, the coins must be inserted in the slit 10 of the payment device 15; this operation facilitates the selection push-buttons 11 of the blister packaging 5, which is positioned in a respective column 20, 13 or 14 of the collector panel 51.

When a user selects a blister packaging 5 of the column 20, 13 or 14, by pressing one of the buttons 11, a logic is activated, which selects the packaging 5 containing the most highly-charged batteries 6 among those preselected and activates the expeller associated therewith, by dropping the packaging itself onto the lower inside surface (positions indicated with 61 and 62 in figure 11B), from which it can be removed by opening the window 69.

Figure 12 illustrates in detail the expulsion and contacting device for recharging the batteries 6 contained inside the thermo-shrinkable plastic lining 60 of the packaging 5.

In particular, in figure 12, the pin 91 of the expeller is shown in a rest position, in which it is maintained by the spring 92.

When an electric current suitably polarized to the coiling 93, is applied, an entrainment force of the pin 91 and compression of the spring 92 is triggered, which

produces the expulsion of the blister packaging 5 towards the right and its consequent falling onto the collection surface situated below the panel 51.

By interrupting the electric current flow, the  
5 spring 92 brings the pin 91 back into the rest position, allowing a new blister packaging 5 to be inserted.

The stainless steel sphere 94, associated with the spring 95, electrically contacts the terminal 80 of the blister packaging 5 for the charging of the batteries 6  
10 contained therein, when the packaging 5 is in a recharging position; in this way, the electric connection with the circuit of the charging device 17 is effected by means of the spring 96.

The filling of the collector panel 51 takes place  
15 from the front window, which, upon opening, makes the recharging slits 18 accessible and allows the introduction of the blister packagings 5 in the various charging positions.

Figures 13A, 13B, 14A, 14B, 15 and 16 illustrate a  
20 further variant of the battery recharging device, object of the invention.

This technical solution uses a blister packaging configuration 5 such as that illustrated in figure 15; in particular, figure 15 shows a blister packaging 5 containing rechargeable batteries 6 of the AA type, analo-  
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gous solutions are possible, however, for geometries of rechargeable batteries of the AAA and 9 Volt type, not shown.

5 In this case, the blister packaging 5 is produced with two symmetrical shells 23, 24 which mechanically hold the batteries 6, leaving the eight terminals free; in this type of packaging 5, each battery 6 can be charged individually.

10 With particular reference to figures 13A and 13B, the battery recharging device according to the invention comprises three columns 16, 26, 37, contained inside an outer casing 35, each of which contains a different type of blister packaging 5.

15 In correspondence with each column 16, 26, 37, the blister packagings 5 are stacked on top of each other, on the horizontal side of the packaging, as better shown in figures 14A, 14B; these figures 14A, 14B also illustrate the sphere contacts and spring 29 for the charging of the batteries 6.

20 The payment device of the blister packagings 5, governed by the control logic 31, is analogous to that described above, and the slit 32 for the insertion of the coins, the visualization display panel 33 and the selection push-buttons 34 are used in particular.

25 The expulsion command of a blister packaging 5 oc-

curs, after payment has been effected, by pressing one of the push-buttons 34 and the consequent activation of the motor 28 (illustrated in detail, with reference to column 16, in figures 14A and 14B).

5       The rotation of the motor 28 produces the downward advancing of the rack pusher 27 having a definite run, equal to the thickness of the blister packaging 5, thus forcing the springs 43 to release the packaging 5 situated below, causing it to fall onto the collection sur-  
10 face 36 (position generically indicated with 22 in figures 13B, 14A and 14B), situated in correspondence with the window 41.

Contemporaneously, all the stack of blister packag-  
ings 5 placed above will move by a position towards the  
15 lower surface and consequently each packaging 5 will receive feeding from the sphere contacts 29 of the underlying surface, keeping the charge active.

Each column 16, 26, 37 contains, in correspondence with the spring contacts 29, the charge circuits (not  
20 shown in the figures) which, suitably connected electrically to the springs 29, maintain the electric charge inside the batteries 6.

The filling of each column 16, 26, 37 takes place from a front window of the casing 35, which, upon open-  
25 ing, makes the three columns 16, 26, 37 accessible and

allows the introduction of the respective packagings 5 in the various charging positions.

Finally, an expelling device of the blister packaging 5, alternative to that described above, is illustrated in figure 16.

In practice, a pusher 27B is used, which can be conveniently moved with a belt 26B, activated, in turn, by the motor 28B, so as to reduce the vertical hindrance of the rod or rack 27 used in the version according to figures 14A and 14B.

The characteristics, as also the advantages, of the battery recharging device, object of the present invention, are evident from the above description.

Finally, numerous other variants can obviously be applied to the battery recharging device in question, all included in the novelty principles inherent to the inventive idea. It is also evident that, in the practical embodiment of the invention, the materials, forms and dimensions of the details illustrated can vary according to requirements and can be substituted with other equivalent alternatives.